

[Conventional Art]

Recently, a large scaled network (hereinafter referred to as the "Internet") in which various networks that have been constructed independently are connected with one another is used in various fields. In contrast with a telephone network or the like, by using the Internet, communication can be carried out with computers etc. arranged not only in Japan but also in foreign countries, just by paying costs for establishing a connection with the Internet. Therefore, an Internet facsimile machine (hereinafter referred to as the "facsimile machine") that reduces communication costs by distributing electronic mail attached with image data via the Internet is being put into practical use.

[0003]

There are various restrictions on the transmission of electronic mail. One example of these restrictions is that the data size of the electronic mail is restricted. Therefore, when the image data of an original document to be transmitted is large and the electronic mail exceeds the permissible data size, even if the electronic mail is transmitted, the electronic mail is rejected from being forwarded. As a result, the electronic mail is not received by an external (destination) device.

[0004]

Therefore, there has been proposed a facsimile machine (for example, refer to Patent Document 1) that can transmit, when an amount of image data of an original document to be transmitted exceeds an amount of data defined for one electronic mail,

electronic mail by dividing the image data to transmit by a plurality of electronic mails even if the amount of the image data is large.

[0005]

[Patent Document 1]

JP,H10-322501,A (pages 1 through 6)

[0006]

[Problems to be Solved by the Invention]

However, in such a facsimile machine, until the end of a process of scanning all original documents to encode into image data, it is necessary to suspend a process of dividing the encoded image data and a process of transmitting the divided image data via electronic mail. Accordingly, a problem is that such facsimile machine requires a long period of time from the start of the scanning of the original document until the end of the transmission of the image data.

[0007]

The present invention has been made in view of such a problem, and has as an object to provide a facsimile machine which scans an original document, and each time an amount of scanned image data exceeds a prescribed amount, in parallel with the scanning of the original document, divides the scanned image data to transmit each of the divided image data by each separate electronic mail. Thus, the facsimile machine can reduce a period of time from a scanning operation of the original document until the end of the transmission of the electronic mails. In addition, the facsimile machine of the present invention can prevent execution of an unnecessary process

by stopping the transmission of the electronic mail when an error occurs in the scanning of the original document or by stopping the scanning of the original document when an error occurs in the transmission of the electronic mail.

[0008]

The present invention has as an object to provide a facsimile machine which, when an error is detected in the transmitted electronic mail, provides the electronic mail with management information of the electronic mail with the error detected, so that information of the electronic mail with the error can be determined at a receiving side.

[0009]

Moreover, the present invention has as an object to provide a facsimile machine which stores electronic mails in a storing means, and when it is determined that the electronic mail can be retransmitted based on content of an error, the facsimile machine of the present invention outputs the electronic mail from the storing means to retransmit so that the burden on a user can be reduced.

[0010]

Further, the present invention has as an object to provide a facsimile machine which, when it is determined that the electronic mail cannot be retransmitted based on the content of the error, stops the scanning of the original document and the transmission of the electronic mail to prevent execution of an unnecessary process performed when the retransmission precluding error occurs.

[0011]

[Means for Solving the Problems]

A facsimile machine according to a first invention is characterized in that the facsimile machine arranged to scan an original document and transmit scanned image data to an external device by electronic mail includes means for dividing the image data in parallel with the scanning of the original document each time an amount of the image data exceeds a prescribed amount, transmitting means for transmitting the divided image data by each separate electronic mail, and means for stopping the transmission of the electronic mail when an error occurs in the scanning of the original document.

[0012]

A facsimile machine according to a second invention is characterized in that the facsimile machine arranged to scan an original document and transmit scanned image data to an external device by electronic mail includes means for dividing the image data in parallel with the scanning of the original document each time an amount of the image data exceeds a prescribed amount, transmitting means for transmitting the divided image data by each separate electronic mail, and means for stopping the scanning of the original document when an error occurs in the transmitting means.

[0013]

A facsimile machine according to a third invention is characterized in that the facsimile machine arranged to scan an

original document and transmit scanned image data to an external device by electronic mail includes means for dividing the image data in parallel with the scanning of the original document each time an amount of the image data exceeds a prescribed amount, transmitting means for transmitting the divided image data by each separate electronic mail, and means for providing the electronic mail, when an error is detected with respect to the transmitted electronic mail, with management information of the electronic mail with the error detected.

[0014]

A facsimile machine according to a fourth invention is characterized in that the facsimile machine includes storing means for storing the electronic mails, and means for outputting the electronic mail from the storing means to retransmit when it is determined that the retransmission can be performed based on content of an error.

[0015]

A facsimile machine according to a fifth invention is characterized in that the facsimile machine includes means for stopping the scanning of the original document and the transmission of the electronic mail when it is determined that the retransmission cannot be performed based on the content of the error.

[0016]

In the facsimile machine according to the first invention, the original document is scanned, and each time the amount of the scanned image data exceeds the prescribed amount, in parallel with the

scanning of the original document, the image data is divided so as to transmit each of the divided image data by each separate electronic mail. When the error occurs in the scanning of the original document, the facsimile machine stops the transmission of the electronic mail. Thus, even when the amount of the image data is large, the electronic mail can be transmitted, and the parallel process of the scanning process of the original document and the process of attaching each image data to the electronic mail to transmit can be performed.

[0017]

In the facsimile machine according to the second invention, the original document is scanned, and each time the amount of the scanned image data exceeds the prescribed amount, in parallel with the scanning of the original document, the image data is divided so as to transmit each of the divided image data by each separate electronic mail. When the error occurs in the transmission of the electronic mail, the facsimile machine stops the scanning of the original document. Thus, even when the amount of the image data is large, the electronic mail can be transmitted, and the parallel process of the scanning process of the original document and the process of attaching each image data to the electronic mail to transmit can be performed. Further, execution of an unnecessary process performed when the error occurs in the transmission of the electronic mail can be prevented.

[0018]

In the facsimile machine according to the third invention, the

original document is scanned, and each time the amount of the scanned image data exceeds the prescribed amount, in parallel with the scanning of the original document, the image data is divided so as to transmit each of the divided image data by each separate electronic mail. When the error is detected with respect to the transmitted electronic mail, the facsimile machine provides the electronic mail with the management information of the electronic mail with the error. Thus, even when the amount of the image data is large, the electronic mail can be transmitted, and the parallel process of the scanning process of the original document and the process of attaching each image data to the electronic mail to transmit can be performed. Further, the information of the electronic mail with the error can be determined at the receiving side.

[0019]

In the facsimile machine according to the fourth invention, the electronic mail is stored in the storing means, and when it is determined that the retransmission can be performed based on the content of the error, the electronic mail is output from the storing means and retransmitted. Thus, the electronic mail with the error can be automatically retransmitted, and the burden on the user can be reduced.

[0020]

In the facsimile machine according to the fifth invention, when it is determined that the retransmission cannot be performed based on the content of the error, the scanning of the original document

and the transmission of the electronic mail are stopped. Thus, the execution of the unnecessary process performed when the retransmission precluding error occurs can be prevented.

[0021]

[Embodiments of the Invention]

With reference to the drawings, a description will be made of embodiments of the present invention.

[0022]

(First Embodiment)

Fig. 1 is a schematic diagram showing a configuration of a communication network connected with a facsimile machine according to the present invention. Reference numerals 1A, 1B, 1C and 1D denote a facsimile machine according to the present invention (hereinafter referred to as "INFAX"). Further, the INFAX 1A, 1B, 1C and 1D (when it is not necessary to distinguish each INFAX, the INFAX 1A, 1B, 1C and 1D will be collectively referred to as "INFAX 1") can be used as a conventional facsimile machine using a Public Switched Telephone Network (PSTN). Thus, the connection with the PSTN is omitted in the drawing.

[0023]

The INFAX 1A, 1B, a Mail Server (MS) 3A, a Personal Computer (PC) 2A or the like are connected to a Local Area Network (LAN), and these devices (the INFAX 1A, 1B, the PC 2A) can carry out communication (transmission and reception) with one another using electronic mail via the MS 3A. Moreover, the LAN is connected to the Internet IN via a router 4, and the INFAX 1C, 1D, a MS 3B, a

PC 2B or the like are connected to the Internet IN. These devices (the INFAX 1C, 1D, the PC 2B, etc.) can carry out communication with one another using electronic mail via the MS 3B. Furthermore, each of the devices connected to the LAN and each of the devices connected to the Internet IN can carry out communication with one another using electronic mail via the MS 3A, 3B and the router 4.

[0024]

Fig. 2 is a block diagram showing a configuration of the facsimile machine according to the present invention. The INFAX 1, which is the facsimile machine according to the present invention, includes a control unit 10 configured with a CPU. The control unit 10 is connected to a scanning unit 12, a printing unit 13, an operation unit 15, a LAN interface (LANIF) 16, a display unit 17, a ROM 18, a RAM 19, an image memory 20, a modem 21, a Network Control Unit (NCU) 22, a Hard Disk (HD) 23 and a data conversion unit 24 via a bus 11. The control unit 10 controls each of the units, and executes various functions in accordance with a computer program stored in the ROM 18 in advance. The control unit 10 functions as various means (scanning/encoding means, dividing means, electronic mail generating means, communication connecting means, electronic mail transmitting means, electronic mail storing means, communication disconnecting means, etc.) in cooperation with each unit or independently.

[0025]

The scanning unit 12 operates as the scanning/encoding means that performs a scanning/encoding process with the control unit 10. The

scanning unit 12 scans an original document to be transmitted, by a scanner using a CCD or the like. Then, for example, the scanning unit 12 generates and outputs image data (encoded data) that has been converted into a binary of black and white by a CODEC (not shown) etc. and encoded, so as to store, via the bus 11, in the image memory 20 including a DRAM etc. As an encoding method, the encoding methods such as Modified Huffman (MH), which is a one-dimensional encoding method, Modified READ (MR), which is a two-dimensional encoding method, and Modified Modified READ (MMR), which is a partially improved MR, are defined by a standard of facsimile communication. Further, an encoding unit such as the CODEC can be provided separately from the scanning unit 12 to perform the encoding.

[0026]

The printing unit 13 is a printer device using an electro-photographic system or the like. The printing unit 13 prints out as hardcopy, image data received from another facsimile machine by facsimile communication or image data received by a communication network. Either one of an Automatic Document Feeder (ADF) method or a Flat Bed Scanner (FBS) method can be used as a scanning method for scanning the original document.

[0027]

The operation unit 15 includes letter keys, a numeric keypad, speed-dial keys, one-touch dial keys, and various function keys or the like that are necessary for operating the INFAX 1, and also functions as an input unit. Further, by applying a touch screen

system to the display unit 17 to be described later, a part or all of the various keys of the operation unit 15 can be substituted.

[0028]

The LANIF 16 is an interface for the INFAX 1 (for example, the INFAX 1A) to carry out communication with another INFAX 1 (1B), the PC (2A), and the MS (3A) via the LAN. The LANIF 16 operates as the communication connecting means, the electronic mail transmitting means, and the communication disconnecting means with the control unit 10 when carrying out an electronic mail transmitting process. Moreover, the LANIF 16 is also connected to the Internet IN via the router 4, and can carry out communication with another INFAX 1 (1C, 1D), the PC (2B), and the MS (3B).

[0029]

The display unit 17 is a displaying device such as a Liquid Crystal Display (LCD). The display unit 17 displays an operation status of the INFAX 1 and also displays the image data of the original document to be transmitted and the received image data or the like.

[0030]

The RAM 19 stores temporary data generated when the computer program is executed by the control unit 10. For example, the RAM 19 includes a DRAM, a flash memory or the like.

[0031]

The modem 21 is configured with a facsimile modem which can carry out facsimile communication. The NCU 22 is connected directly to the modem 21. The NCU 22 establishes and disconnects a connection with the PSTN. When necessary, the NCU 22 connects the modem 21

to the PSTN, and controls the facsimile communication between the INFAX 1 and an outside facsimile machine (a conventional facsimile machine which does not use electronic mail).

[0032]

The data conversion unit 24 operates as the dividing process means that performs a dividing process with the control unit 10. The data conversion unit 24 monitors an amount of the image data of the original document (encoded data) encoded in accordance with the above-described facsimile machine standard. Each time the amount of data exceeds a prescribed amount, the data conversion unit 24 divides the image data (encoded data), and converts the divided image data (encoded data) into an image format of a TIFF Format or a PDF Format so as to construct a data structure capable of the transmission by electronic mail. When transmitting, the TIFF image format is converted (encoded) from binary data into text data by using, for example, a Multipurpose Internet Mail Extensions (MIME) base 64. Further, when receiving, conversion (decoding) that is opposite of the conversion carried out at the transmission can be carried out.

[0033]

Moreover, the data conversion unit 24 operates as the electronic mail generating means to carry out an electronic mail generating process with the control unit 10. When transmitting electronic mail, the data conversion unit 24 generates electronic mail that includes an electronic mail header (hereinafter referred to as a "header") and image data (TIFF data) that is converted into text

data. Further, the header includes information such as a transmission date and time of the electronic mail, a transmitter of the electronic mail, a transmission destination of the electronic mail and additional information of the electronic mail.

[0034]

The HD 23 is a memory having a large capacity, and appropriately stores accumulation of the image data, an electronic mail address, a facsimile number, a name of a transmission destination, a facsimile number corresponding to a speed-dial key, and a telephone directory or the like. Moreover, the HD 23 operates as the electronic mail storing means to carry out an electronic mail storing process with the control unit 10. The HD 23 stores the electronic mail transmitted in the electronic mail generating process. In addition, the HD 23 receives information on whether or not an external device received the transmitted electronic mail. When it is determined that the external device received the electronic mail, or when a prescribed period of time elapses after the electronic mail is stored in the HD 23, the electronic mail stored in the HD 23 is erased. Accordingly, the electronic mail received by the external device, in other words, the electronic mail that is not necessary to be stored, is erased, and the available capacity in the HD 23 can be increased.

[0035]

Next, the content of the electronic mail generated by the data conversion unit 24 will be described in detail. Fig. 3 shows an example of the content of an electronic mail. The header includes

"field name", ":" and "field content", and in some fields, the field is delimited by ";" and provided with detailed information by a parameter consisting of "parameter name", "=" and "parameter content".

[0036]

In the header, a field 41 is a field extended by the MIME, and indicates that a main text is divided into a plurality of components. The parameter delimited by ";" (boundary=) shows delimiter information of each of the divided components. That is, "--=_xxx_" of the main text shows the start of each of the components, and "--=_xxx_--" shows the end of the components. Further, each of the divided components has a format of "header", "blank line" and "main text" respectively.

[0037]

The first component includes management information of the electronic mail. A field 42 indicates that the main text is data in a text format, and by the parameter delimited by ";" (charset=), indicates that the character code is "us-ascii". A field 43 indicates the data conversion format of the main body, but a field name "7bit" indicates 7bit data without encoding.

[0038]

Then, a blank line is inserted, and in a main text 44, the management information of the electronic mail is provided by the character code "us-ascii". The management information includes "DOCUMENT-ID" which indicates an identification number of the original document (document), "PAGE-NO" which indicates page

information of the original document, "BLOCK" which indicates a transmission number of the electronic mail, in other words, an order of the electronic mail among the transmission electronic mails, "PREVIOUS" which indicates a transmission number of the already transmitted electronic mail, "NEXT" which indicates a transmission number of electronic mail to be transmitted next, and "TOTALBLOCK" which indicates a total number of electronic mails planned to be transmitted. Here, "PAGE-NO" includes three pieces of information: a page number of the original document; a number which indicates an order of the data in that page; and a flag which indicates whether or not the data is the last data of that page. For example, it can be defined that a flag "0" is applied when the data is the last data of that page, and a flag "1" is applied when the data is not the last data. In the example shown in Fig. 3, the management information "PAGE-NO" is "2-3-0". That is, the "3"rd data of the "2"nd page of the original documents is attached to the electronic mail, and since the flag is "0", the "2"nd page of the original documents is divided into "3" data and transmitted. Further, the management information "TOTALBLOCK" can be provided as information when the scanning/encoding process for all original documents has been completed. When the scanning/encoding process is not completed yet, dummy information such as a null character or "-99" defined in advance can be provided as the management information "TOTALBLOCK".

[0039]

The next component includes image data attached to the electronic

mail and information of the image data. A field 51 is a field extended by the MIME, indicates that a main text is TIFF image data, and indicates information on a file name by a parameter (name=) delimited by ";". A field 52 indicates that a conversion (binary/text conversion) format of the data is the MIME (base64). A field 53 indicates that a disposition method of the data is an attached file, and indicates information on the file name by a parameter (filename=) delimited by ";".

[0040]

A blank line is inserted, and in a main text 54, the TIFF data converted from binary data into text data by the MIME (base 64) is provided.

[0041]

Further, when determining whether or not the external device received the transmitted electronic mail, for example, a field of "Disposition-Notification-To: (own electronic mail address)" is added to the header of the electronic mail shown in Fig. 3, and the electronic mail is transmitted. Then, when the receiving device receives the electronic mail, the receiving device may return electronic mail indicating the reception.

[0042]

Next, an operation of the facsimile machine according to the first embodiment will be described with reference to a flowchart. Fig. 4 is the flowchart showing a process protocol carried out by the facsimile machine according to the first embodiment of the present invention.

[0043]

A user provides an original document table of the ADF or the FBS with an original document to be transmitted (S11). A scanning/encoding condition such as the resolution and the encoding method or the like of the scanning unit 12, and a transmission condition such as an electronic mail address of the transmission destination and a prescribed amount that defines the amount of the image data to be attached to one electronic mail, are entered from the operation unit 15 (S12). Furthermore, when a start command of the process is entered from the operation unit 15 (S13), the INFAX 1 carries out a parallel process of a scanning/encoding process, a dividing process, a communication connecting process, an electronic mail generating process (including image converting process and binary/text converting process), an electronic mail transmitting process and a communication disconnecting process, all of which are described later. Further, in S12, the scanning/encoding condition and the transmission condition are not entered respectively by the user. As shown in Fig. 5, a name of the destination device, such as a nickname, that is associated with the scanning/encoding condition and the transmission condition can be registered in the HD 23 as a table, and the name can be selected. Moreover, when transmitting and receiving the data with the destination device, it is preferable to receive information on a receiving ability or the like of the destination and to update the table automatically.

[0044]

Then, when the INFAX 1 receives the start command of the process in S13, the scanning/encoding process is executed (S14). That is, in case of the ADF, the original documents placed on the original document table are fed one sheet at a time, and in accordance with the scanning/encoding condition entered in S12, the original document is scanned by the CCD of the scanning unit 12. Then, the image data encoded by the encoding method, such as the MH, the MR or the MMR, is stored in the image memory 20.

[0045]

Meanwhile, in parallel with the scanning/encoding process (S14), the INFAX 1 executes the dividing process (S21). In the dividing process, the INFAX 1 accesses the image memory 20, calculates the amount of the image data of the stored original document, and each time the calculated amount exceeds a prescribed amount, the INFAX 1 divides the image data. Then, the image converting process (S22) is executed for converting the divided image data into TIFF data. Furthermore, the binary/text converting process (S23) is executed for converting the TIFF data (binary data) into text data by the MIME (base 64).

[0046]

Then, the electronic mail generating process (S24) is executed in which the information indicating that the transmission data is the TIFF data and the information indicating that the data has been converted from binary data into text data by the MIME (base64) are provided to the header of the electronic mail, and the text data converted in S23 is provided to the electronic mail.

[0047]

Next, a TCP session is established with an external device (hereinafter referred to as a transmission destination) (S25). Then, the electronic mail transmitting process (S26) is executed for transmitting the electronic mail by the SMTP. When the transmission is completed, the electronic mail storing process (S27) is executed for storing the transmitted electronic mail in the HD 23, and the TCP session established with the transmission destination is disconnected (S28). That is, S25 corresponds to the communication connecting process and S28 corresponds to the communication disconnecting process.

[0048]

Then, it is determined whether or not all electronic mails have been transmitted (S29). When it is determined that all electronic mails have not been transmitted (S29: NO), the process proceeds to S21, and the processes of S21 through S29 are executed. Meanwhile, when it is determined that all electronic mails have been transmitted (S29: YES), the process is ended.

[0049]

In addition, the facsimile machine according to the present invention monitors various errors, and when an error is detected during the above-described process protocol, the following interruption process is executed. Figs. 6 and 7 are flowcharts showing the interruption process carried out by the facsimile machine according to the first embodiment of the present invention.

[0050]

The INFAX 1 monitors whether or not an error is occurring in the scanning/encoding process (S41). When an error is detected in the scanning/encoding process (S41: YES), the occurrence of the error in the scanning/encoding process is notified (S42). Then, an interruption signal for stopping the electronic mail transmitting process is generated (S43), and the process is ended (first interruption process: Fig. 6(a)).

[0051]

Moreover, the INFAX 1 monitors whether or not an error is occurring in the electronic mail transmitting process (S51). When an error is detected in the electronic mail transmitting process (S51: YES), the occurrence of the error in the electronic mail transmitting process is notified (S52). Then, an interruption signal for stopping the scanning/encoding process is generated (step S53), and the process is ended (second interruption process: Fig. 6(b)).

[0052]

Furthermore, the INFAX 1 monitors whether or not an error is occurring in the transmitted electronic mail by receiving an error notification mail or a delivery confirmation mail or the like regarding the transmitted electronic mail (S61). Then, when the occurrence of an error is detected in the electronic mail (S61: YES), in accordance with the content of the error, management information for the electronic mail is generated (S62), and the generated management information is provided to the electronic mail (S63).

[0053]

Then, it is determined whether or not the electronic mail with the error detected can be retransmitted (S64). For example, when a character string of "Host unknown" or "User unknown" is detected in the error notification mail, it can be assumed that the error is due to a typing error in the electronic mail address of the transmission destination, which is the transmission condition entered in S12. Therefore, it is determined that an error will occur again even if the electronic mail is retransmitted. In other words, it is determined that the electronic mail cannot be retransmitted. When it is determined in S64 that the electronic mail cannot be retransmitted (S64: NO), an interruption signal is generated (S65) for stopping the scanning/encoding process and the electronic mail transmitting process, and the process is ended. Meanwhile, when it is determined that the electronic mail can be retransmitted (S64: YES), the character string is extracted from the "Message-Id" field of the electronic mail with the error. Then, the INFAX 1 accesses the HD 23, and outputs the electronic mail which has the extracted character string in the "Message-Id". The electronic mail is retransmitted by the electronic mail transmitting process (S66), and the process is ended (third interruption process: Fig. 7).

[0054]

Here, the management information of the electronic mail generated in S62 will be described. Fig. 8 shows an example of the content of the management information to be added to the electronic mail. The management information to be added is described by the character code "us-ascii", and includes "DOCUMENT-ID" which indicates an

identification number of the original document (document), "ERROR" which indicates a transmission number of the electronic mail with the error occurred, and "RETRANSMISSION" which indicates a transmission number of the electronic mail planned to be retransmitted. The management information is added to the electronic mail generated in the electronic mail generating process.

[0055]

Next, the operation timing of the facsimile machine according to the present embodiment will be described. Fig. 9 is an explanation diagram for explaining a state of the operation timing of the facsimile machine according to the first embodiment of the present invention. The horizontal axes indicate an elapse of time. In the drawing, (a) shows a state of the scanning/encoding process of the scanning unit 12, (b) shows a state of the dividing process, (c) shows a state of the electronic mail generating process, (d) shows a state of the communication connecting process, (e) shows a state of the electronic mail transmitting process, and (f) shows a state of the communication disconnecting process.

[0056]

When a start command for transmitting the original document is received, the control unit 10 controls the operation of the scanning unit 12. The scanning unit 12 executes the scanning/encoding process to scan the original documents consisting of "n" pages by the scanner under the ADF method sequentially from a first page P1 until completing the scanning of a n-th page Pn, which is the

last page of the original documents (in the drawing (a)). In the drawing, the time between the scanning/encoding process of each page indicates the time required for feeding the original document by the ADF method.

[0057]

Moreover, in parallel with the scanning/encoding process, each time the amount of the image data (encoded data) scanned in the scanning/encoding process exceeds the prescribed amount defined in advance, the dividing process is executed to divide the image data into image data PD1 (PD2, ..., PDm) (in the drawing (b)). In the drawing, reference numerals PD1, PD2, ... and PDm show the image data (divided state) divided first, second, ..., and m-th respectively.

[0058]

Then, when the image data is divided into the image data PD1 (PD2, ..., PDm) in the dividing process, the image converting process in which the image data PD1 (PD2, ..., PDm) is converted into TIFF data, the binary-text converting process in which the TIFF data is converted into text data, and the electronic mail generating process in which a header is generated, the image data converted into the text data is attached to electronic mail, and electronic mail M1 (M2, ..., Mm) is generated, are executed (in the drawing (c)). In the drawing, reference numerals M1, M2, ... and Mm show the electronic mails (generating state) that are generated from the image data PD1, PD2, ..., and PDm respectively.

[0059]

Then, when the electronic mail M1 (M2, ..., Mm) is generated in the electronic mail generating process, the communication connecting process is executed by the TCP for establishing the communication (connection) with the transmission destination via the LANIF 16 (in the drawing (d)). When establishing the communication (connection) with the transmission destination, a communication start command, which starts the communication, (for example, HELO command of the SMTP) is transmitted to the transmission destination. In the drawing, reference numerals C1, C2, ..., and Cm show the transmission state of the communication start command prior to the transmission of each of the electronic mails M1, M2, ..., and Mm respectively.

[0060]

When the connection is established with the transmission destination in the communication connecting process, the electronic mail transmitting process is executed (in the drawing (e)) for transmitting to the LAN or the Internet, the electronic mail M1 (M2, ..., Mm) generated in the electronic mail generating process. In the drawing, reference numerals MM1, MM2, ..., and MMm show the transmission state of the electronic mails M1, M2, ..., and Mm respectively.

[0061]

Furthermore, each time the transmission of the electronic mail MM1 (MM2, ..., MMm) in the electronic mail transmitting process ends, the communication disconnecting process is executed for disconnecting the connection established with the transmission

destination (in the drawing (f)). When disconnecting the connection established with the transmission destination, an end command for ending the communication (for example, QUIT command of the SMTP) is transmitted to the transmission destination. In the drawing, reference numerals D1, D2, ..., and Dm show the transmission state of the end command transmitted after the transmission of each of the electronic mails MM1, MM2, ..., and MMm respectively.

[0062]

Here, each of the transmitted electronic mails MM1, MM2, ..., and MMm is one electronic mail, respectively. The external device receives each of the electronic mails MM1, MM2, ..., and MMm as separate electronic mail. In accordance with the header and the main text of each of the electronic mails MM1, MM2, ..., and MMm, the original document is reconstructed.

[0063]

A conventional facsimile machine converts into image data from an original document, divides the image data, and transmits each image data by electronic mails. On the contrary, the facsimile machine according to the present invention carries out the electronic mail transmitting process in parallel with the scanning/encoding process. As a result, the facsimile machine according to the present invention can reduce the period of time required from the start of the scanning of the original document until the end of the transmission of the image data.

[0064]

Moreover, the external device that receives the electronic mail transmitted by the facsimile machine according to the present invention can obtain the information of the attached image data by reading the management information described in the electronic mail. For example, from the management information "DOCUMENT-ID" and "BLOCK", the external device can learn the number of the electronic mail and the original document to which the electronic mail belongs. From the management information "DOCUMENT-ID" and "NEXT", the external device can learn whether or not any further electronic mail will be transmitted. From the management information "DOCUMENT-ID" and "TOTALBLOCK", the external device can learn the total number of electronic mails. From the management information "DOCUMENT-ID" and "PAGE-NO", when the image data of the same original document is divided into a plurality of image data and transmitted, the image can be reconstructed easily based on this information. For example, when electronic mail with the management information "PAGE-NO" indicating "2-3-0" is received, it can be acknowledged that the second page of the original documents is divided into three electronic mails and transmitted. Then, the electronic mails with the management information "PAGE-NO" indicating "2-1-1", "2-2-1" and "2-3-0" can be extracted, and the image of the second page of the original documents can be reconstructed from the image data attached to each of the electronic mails.

[0065]

Furthermore, by reading the management information "DOCUMENT-ID",

"ERROR" and "RETRANSMISSION" that are described in the electronic mail, the external device that received the electronic mail transmitted by the facsimile machine according to the present invention can learn the transmission number of the electronic mail with the error and the transmission number of the electronic mail to be retransmitted.

[0066]

(Second Embodiment)

In the first embodiment, the INFAX 1 establishes the TCP session with the transmission destination before transmitting each electronic mail, and after transmitting each electronic mail, the INFAX 1 disconnects the TCP session each time. However, in the present embodiment, when the start command for transmitting the original document is received, the facsimile machine establishes the TCP session with the transmission destination, and maintains the TCP session until all electronic mails are transmitted.

[0067]

Next, the operation of the facsimile machine according to the second embodiment of the present invention will be described with reference to a flowchart. Fig. 10 is a flowchart showing the process protocol carried out by the facsimile machine according to the second embodiment of the present invention.

[0068]

When a start command of the process is received in S13, the INFAX 1 establishes a TCP session with the transmission destination (S20) in parallel with the scanning/encoding process (S14). When the

session is established, the above-described dividing process (S21), image converting process (S22), binary/text converting process (S23), electronic mail generating process (S24), electronic mail transmitting process (S26), and electronic mail storing process (S27) are executed.

[0069]

Then, it is determined whether or not all electronic mails have been transmitted (S29). When it is determined that all electronic mails have not been transmitted yet (S29: NO), the process proceeds to S21 with the session maintained, and the processes of S21 through S29 are executed. Meanwhile, when it is determined that all electronic mails have been transmitted (S29: YES), the session is disconnected (S30) and the process is ended. Further, when necessary, a connection maintaining command (for example, NO Operation (NOOP) command of the SMTP) for maintaining the connection with the transmission destination is transmitted to the transmission destination and the session is maintained. As described above, by transmitting the connection maintaining command appropriately to the transmission destination and maintaining the connection, a transmission error such as time-out can be prevented from occurring. Since other process protocols are similar to those of Fig. 4, like reference numerals are applied to the corresponding parts and the detailed description thereof will be abbreviated.

[0070]

Next, the operation timing of the facsimile machine according to the present embodiment will be described. Fig. 11 is an explanation

diagram for explaining a state of operation timing of the facsimile machine according to the second embodiment of the present invention. In the present embodiment, a state of the communication connecting process (d) and a state of the communication disconnecting process (f) differ from those of the first embodiment.

[0071]

That is, only when the first electronic mail M1 is generated in the electronic mail generating process, a communication start command C is transmitted, and the communication connecting process is executed by the TCP for establishing the connection with the transmission destination via the LANIF 16 (in the drawing (d)). Then, the electronic mail transmitting process is executed for transmitting on the LAN or the Internet, the electronic mail M1 (M2, ..., Mm) generated in the electronic mail generating process (in the drawing(e)). Furthermore, only when the transmission of the last electronic mail MMm in the electronic mail transmitting process is completed, the communication disconnecting process is executed for disconnecting the connection with the transmission destination by transmitting an end command D (in the drawing (f)). In other words, when the transmission of the electronic mails MM1, MM2, ..., and MMm-1 is completed, the communication disconnecting process is not executed. The state of the other operation timings is similar to those shown in Fig. 9. Therefore, like reference numerals are applied to the corresponding parts and the detailed description thereof will be abbreviated.

[0072]

In other words, the facsimile machine of the present embodiment establishes the TCP session with the transmission destination and then executes various other processes. Then, until all electronic mails are transmitted, the session is maintained. Therefore, compared with the process protocol that establishes and disconnects the session with the transmission destination each time each electronic mail is transmitted, the period of time required from the start of the scanning of the original document until the end of the transmission of the image data can be reduced.

[0073]

Further, it has been described that in each of the embodiments, each time the amount of the image data exceeds the prescribed amount, the image data is divided. However, as shown in Fig. 12, the image data can be divided for each page of the original documents, and each of the divided image data can be attached to electronic mail and transmitted to the external device. In other words, the dividing process (in the drawing (b)) is executed for dividing the image data (encoded data) scanned in the scanning/encoding process into the image data PD1 (PD2, ..., PDn) for each page of the original documents. In the drawing, reference numerals PD1, PD2, ..., and PDn show the image data divided first, second, ..., and n-th respectively, in other words, the image data of the first page P1, the second page P2, ..., and the n-th page Pn of the original documents. The state of the other operation timings is similar to those shown in Fig. 9. Therefore, like reference numerals are applied to the corresponding parts and the detailed description thereof will be

abbreviated.

[0074]

[Advantages of the Invention]

As described above, according to the facsimile machine of the present invention, the original document is scanned, and each time the amount of the scanned image data exceeds the prescribed amount, in parallel with the scanning of the original document, the scanned image data is divided.. Further, by transmitting each of the divided image data by electronic mail, the facsimile machine of the present invention can perform the parallel process of the process of scanning the original document and the process of transmitting each image data by electronic mail. Therefore, the period of time required from the start of the scanning of the original document until the end of the transmission of the image data can be reduced.

[0075]

Moreover, according to the facsimile machine of the present invention, the scanned image data is divided, and by attaching each of the divided image data to each separate electronic mail to transmit, the capacity of the electronic mail to be transmitted can be reduced. Therefore, even if the external device has a restriction on the amount of the image data, the reception is not refused, and the image data can be transmitted to a desired external device.

[0076]

According to the facsimile machine of the present invention, when the error occurs in the scanning of the original document, the

transmission of the electronic mail is stopped, or when the error occurs in the transmission of the electronic mail, the scanning of the original document is stopped. Thus, the execution of the unnecessary process can be prevented.

[0077]

According to the facsimile machine of the present invention, when the error with respect to the transmitted electronic mail is detected, by providing the electronic mail with the management information of the electronic mail with the error detected, the information of the electronic mail with the error can be determined at the receiving side.

[0078]

According to the facsimile machine of the present invention, the electronic mail is stored in the storing means, and when it is determined that the retransmission can be performed based on the content of the error, the electronic mail is output from the storing means and transmitted. Thus, the burden on the user can be reduced.

[0079]

Further, according to the facsimile machine of the present invention, when it is determined that the retransmission cannot be performed based on the content of the error, by stopping the scanning of the original document and the transmission of the electronic mail, advantageous effects such as prevention of the execution of the unnecessary process performed when the retransmission precluding error occurs can be achieved.

[Brief Description of the Drawings]

[Fig. 1]

Fig. 1 is a schematic diagram showing a configuration of a communication network connected with a facsimile machine according to the present invention.

[Fig. 2]

Fig. 2 is a block diagram showing a configuration of a facsimile machine according to the present invention.

[Fig. 3]

Fig. 3 shows an example of content of electronic mail.

[Fig. 4]

Fig. 4 is a flowchart showing a process protocol carried out by a facsimile machine according to a first embodiment of the present invention.

[Fig. 5]

Fig. 5 is a schematic diagram showing an example of content of a table.

[Fig. 6]

Fig. 6 is a flowchart showing a process protocol of an interruption process carried out by the facsimile machine according to the first embodiment of the present invention.

[Fig. 7]

Fig. 7 is a flowchart showing a process protocol of the interruption process carried out by the facsimile machine according to the first embodiment of the present invention.

[Fig. 8]

Fig. 8 shows an example of content of management information added

to electronic mail.

[Fig. 9]

Fig. 9 is an explanation diagram showing a state of operation timings of the facsimile machine according to the first embodiment of the present invention.

[Fig. 10]

Fig. 10 is a flowchart showing a process protocol carried out by a facsimile machine according to a second embodiment of the present invention.

[Fig. 11]

Fig. 11 is an explanation diagram for explaining a state of operation timings of the facsimile machine according to the second embodiment of the present invention.

[Fig. 12]

Fig. 12 is an explanation diagram for explaining a state of operation timings of the facsimile machine in another example of a dividing process.

[Description of the Reference Numerals]

1, 1A, 1B, 1C, 1D Facsimile machine (INFAX)

2A, 2B Personal Computer (PC)

3A, 3B Mail Server (MS)

4 Router

10 Control unit

11 Bus

12 Scanning unit

13 Printing unit

15 Operation unit
16 LAN Interface (LANIF)
17 Display unit
18 ROM
19 RAM
20 Image memory
21 Modem
22 Network Control Unit (NCU)
23 Hard Disk (HD)
24 Data conversion unit
IN Internet
LAN Local Area Network
PSTN Public Switched Telephone Network